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ABSTRACT

Although sex differences in reading and related language functions have frequently been reported for both average and retarded readers, the explanations thus far proposed (maturation rate, sex-role development, textbook content, "female bias," and psycho-social factors) do not satisfactorily account for these differences. One hypothesis that might explain why girls excel boys on a variety of reading tasks is that a sex-linked inherited trait, which could be labeled "ability to acquire and process language fluently," exists. Such a trait would be formed by a complex combination of genes, since language functions depend on a complex set of sensorimotor and cognitive characteristics. A physical analogy to the trait would be height, which is polygenic and distributed differently between sexes. If this biological explanation were to hold true, it would redirect language research and instruction toward genetic considerations, promote the use of genetic counseling for early remedial intervention, and provide valuable clues toward understanding the nature of dyslexia and related language disorders. (RL)

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Nicholas C. Aliotti

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Sex Differences in Reading: A Biological Explanation¹

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Synopsis-abstract

Sex differences in reading and related language functions have frequently been reported for both average and retarded readers. Specifically, at the primary age level and earlier, girls excel boys on a variety of reading and language tasks. Moreover, when groups of retarded readers are considered, boys are disproportionately represented. Maturation rate, sex-role development textbook content, "female bias," and the like have been offered as possible explanations. These and other explanations were examined in the light of recent research. It was hypothesized, following Bannatyne (1971), that the most parsimonious explanation which could account for this phenomenon is a sex-linked inherited trait, "Ability to Acquire and Process Language Fluently." If correct, this explanation could have important implications for professionals in reading and related disciplines. Currently considerable attention has focused on psycho-social factors, many of which do not satisfactorily account for these sex differences. Consequently, they do not appear to be productive avenues of research. Implications are discussed in terms of genetic factors in language development, genetic counseling, and early remedial intervention.

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2. The author wishes to thank Ms. Kay Rosell for her assistance in completing this review.

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Disproportionate Number of Boys

The majority of professionals who have concerned themselves with reading disabled children, both in clinical practice and research, have consistently found that these children are represented by a disproportionate number of boys. Eisenberg (in Money, 1966), for example, observed that among Commuter County children, boys were over-represented 2 to 1 in reading clinic populations. This finding is consistent with other surveys of reading performance (Bentzen, 1963; Miller et al., 1957; Rutter et al., 1970.) Heilman (1961, p. 356) has reported data from nine studies of remedial reading cases referred to reading clinics. The ratio of boys and girls ranged from 2:1 to 33:1. Similarly, Blom's (1971) review of four studies of sex differences in reading disability completed during the sixties revealed ratios favoring boys 2:1 to 5:1.

Reading Achievement of First Grade Girls

Conversely, sex differences in first-grade reading achievement favoring girls continue to be reported (Hahn, 1966; Schneyer, 1966; Spache et al., 1966; Tanyzer and Alpert, 1966; and Good and Brophy, 1971). Research studies have typically documented the superiority of girls on a variety of language functions including sentence length (Day 1932; Davis, 1937), Koenigsknecht and Friedman, 1976), grammar (Davis, 1937), reading readiness and achievement (Anderson, et al., 1957; Gates, 1961; Balow, 1963), syntax maturity (Koenigsknecht and Friedman, 1961), and vocabulary (Jersild and Ritzmann, 1938).

However, sex differences in primary and preprimary age children have not been found for the ability to handle English morphology (Berko, 1961), psycholinguistic abilities (McCarthy and Kirk, 1963; Swearngen, 1966), and

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auditory perception (McNinch, 1971). This apparent contradiction may be related to the burgeoning increase of knowledge in reading and other psycholinguistic behaviors. Indeed, indices such as sentence length appear overly simplistic in assessing language functioning. Today reading and related language functions are more likely to be indexed by studies of phonological development, distinctive features, and the like (Cazden, 1971; Menyuk, 1968). Surprisingly, however, an examination of psycholinguistic research revealed little information regarding sex differences. Menyuk (1969), for example, investigated the varying syntactic structures children use in sentences. Neither boys nor girls used significantly more syntactic structures. Menyuk attributed the lack of sex differences to the fact that basic syntactic structures were not under consideration, but rather, measures of language such as mean sentence length as well as experimenter and situational variables. Perhaps the relative superiority of girls may be associated with specific tasks which require the processing of language rather than static tasks which require gross discriminations. Thus, sex differences may not obtain for a measure of auditory reception while girls may be relatively superior to boys on complex tasks which stress higher-level language skills.

In their book, The Psychology of Sex Differences Maccoby and Jacklin (1974), reviewed an extensive literature. Of particular relevance were those sections (pp.75-88) which reviewed reading and verbal abilities. In the areas of spontaneous vocal and verbal behavior and tested verbal abilities of 186 research comparisons, 100 showed no differences, 67 favored females, and only 19 favored males. Inspection of the table with the largest samples clearly demonstrated the superiority of females in this area. In general,

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females enjoy an advantage of about .25 standard deviation. Developmentally females seem to have an early advantage in verbal ability up to the primary school years, show little advantage up to the pre-adolescent period, and again show an advantage in the adolescent years and later.

Although there is substantial evidence that sex differences in reading exist, relatively little attention to this finding is reflected in reading texts. Table I presents a survey of pages devoted to sex differences in 44 reading texts.

Insert Table I about here

For tests published in the 60's and 70's approximately half do not report on sex differences, a little less than one third report a half page or less, and less than one fifth report one page or more on this topic.

A number of explanations have been offered to account for sex differences in reading. Physical differences in maturation between males and females, cultural expectations, sex-role development, "female bias", teacher expectations, reader content, and inherited factors are representative examples. The purpose of this paper is to systematically review these explanations and examine their ability to (1) account for the disproportionate number of boys among disabled readers, and (2) account for boys' relatively poor performance on reading tasks when compared to girls.

Sex-Role Development

The differential treatment of boys and girls has often been suggested as

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a possible explanation of sex differences in reading. The sex-typing hypothesis holds that members of each sex are encouraged and become interested and proficient in those activities deemed relevant and appropriate for their current and future roles. It is argued, for example, that among girls such behaviors as good work habits, articulation, correct grammar, and the like are more likely to be rewarded by parents, teachers, and other significant adults. Such reinforcement supposedly supports the acquisition of reading competency. Conversely, boys are expected and indeed encouraged to be more concerned with manipulation, concrete objects, and visuo-spatial tasks.

Modeling

Carlsmith (1964) presented a sex-role hypothesis based on social learning theory or modeling. Accordingly, he has suggested that girls may be more verbal and boys more quantitative because children tend to model themselves primarily on the same-sex parent. This argument holds that since mothers are typically more verbal and fathers more skilled in quantitative tasks, modeling the same-sex parent results in a differential pattern of abilities among boys and girls.

Maccoby (1966, p. 42-43) finds a number of difficulties with this explanation. She has noted that not all aspects of intellectual functioning are susceptible to modeling. For example, spelling, covert quantitative reasoning and spatial thinking are not readily communicated from parent to child. Furthermore, these differences obtain long before the child has developed a firm sex role identification. At an older age, however, some effects from modeling may operate.

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School as a Feminine Institution

It has been suggested that the school curriculum and atmosphere is by and large representative of a feminine institution. The reasons for this include: (1) the failure to include text and instructional material in beginning reading which would appeal to boys, (2) a conceptualization of reading as a passive behavior which does not challenge action-oriented boys and (3) the domination of women as the significant figures associated with encouraging and teaching reading, i.e., "female bias."

Stated differently proponents of this view (Ayres, 1909; St. John, 1932; Davidson and Lang, 1960; McNeil, 1964; Minuchin, 1966; Kagan, 1966; Lee, 1973, Gentile and McMillan, 1976) would hold that the demands of schools are better matched to feminine rather than masculine interests and needs. Accordingly, it is argued that the reading process has become sex-typed as feminine & that this has worked against the development of reading competency in boys. Indeed, Austin et al., (1971) in their book, Reading Rights for Boys, argue for a masculine-oriented language experience approach which would offer promise as a method for teaching boys to read, McCarty (1953), for example, concluded that the female domination of primary grades and the maternal domination of the early years of life encourage verbal, interpersonal behaviors rather than the active, exploratory behaviors characteristic of boys.

Interestingly, if such biases were operating it is difficult to explain why boys either excel girls or show no significant differences in the area of mathematics--despite the fact that these subjects are taught in a "feminine" institution. Results have generally favored boys or shown no differences (Cunningham and Price, 1934; Heilman, 1933; Kellner Pringle, et al., 1966; Maccoby and Jacklin, 1974). When differences are found favoring girls they

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have tended to be associated with computation skills (Dykstra and Tinny, 1969; Rutter et al., 1970).

Moreover, as Good and Brophy (1971) correctly pointed out, if "female bias" is accounting for differential rates of reading achievement, the "effect" should be demonstrated in explicit differential behavior on the part of teachers during reading instruction. To study this question these researchers had teachers rank pupils in four first grade classrooms on general achievement. Three high and three low achievement boys and girls were selected for observational study during reading instruction. The results indicated that for a variety of teacher behaviors, for example number of reading turns and number of teacher-afforded opportunities, teachers extended equal treatment to boys and girls. Not surprisingly, high achievement pupils received some preferential treatment and boys more than girls were the target of teacher criticism. The authors concluded, however, that the fact that girls learn to read faster than boys cannot be attributed to teacher behavior during group instruction.

The logic of this position suggests two basic experiments which would clarify this issue: (1) "masculinize" the school by increasing the number of male teachers in reading and/or (2) modify the instructional materials in reading to reflect masculine interests.

However, in a recent systematic study there was little support for the "masculinize" hypothesis, Asher and Gottman (1973) investigated the effects of sex of teacher on reading achievement. The subjects were 534 students enrolled in ten elementary schools which had a male teacher. Comparison data were collected from peers who had female teachers in these same schools. Pre and posttesting on the Iowa Basic Skills reading comprehension test revealed

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the usual superiority of girls. No significant differences were found on the gain scores of boys and girls taught by either male or female teachers.

With respect to the second research strategy, Wyatt (1965) working at the first grade level, investigated sex differences in reading achievement under three different methods: a linguistic approach, a basal reader approach with ability grouping, and an approach using basal readers with intra-class grouping based on sex as well as ability. Wyatt found no support for the hypothesis that approaches to reading could account for the greater performance of girls on reading measures.

Thus, an attempt to utilize reading groups composed of boys only, where pace and emphasis of instruction could be adapted to suit boys' needs, failed to improve reading achievement.

Tregaskis (1972) tested this hypothesis in his doctoral dissertation. Seventy-eight first-grade boys in a rural upstate New York school district were administered instruments developed to measure sex role standards of reading, readiness to assume feminine attributes, and reading achievement. The treatment designed to masculinize reading consisted of three elements: (1) a weekly 20-minute exposure to a narrated slide presentation showing male figures in prestigious role promoting reading; (2) middle-school males tutoring in reading; and (3) beginning reading materials that contained stories written and illustrated so as to have particular appeal to boys. A control group received literary experiences which afforded them comparable attention but which were not directed toward a particular sex role standard of reading.

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While reading was sex-typed as feminine by the children (quite possibly a function of the sex role instrument), the treatment did not affect the reading achievement of the subjects. That is, the 12-week program of "masculinization" did not facilitate performance on a test of reading achievement (Sipay Word Analysis Test).

In a related study Asher and Markell (1973) tested the hypothesis that interest level of reading material was an important determinant of sex differences in reading. The investigators first established high and low interest areas for a group of 87 fifth grade children. Later, they were tested for reading comprehension by utilizing a cloze procedure (Taylor, 1953) in which subjects were required to provide answers to deletions in the high and low interest level paragraphs as previously established. Girls scored significantly better than boys ($p < .01$) and comprehension scores are superior for the high interest paragraphs. Interestingly, a significant sex X interest level ($p < .01$) interaction obtained. Boys showed a significant difference in reading performance when high and low interest materials were contrasted. Thus, the interest level of the reading material markedly reduced, but did not compensate for the superior performance of the girls. Systematic attempts to manipulate the contents of reading instruction or the sex of instructors did not appear to be an important factor in accounting for sex differences in reading.

Cross-cultural Studies and Sex of Teacher

Cultural variation and sex of teacher have both been investigated with respect to sex differences, often concurrently. Preston (1962), for example,

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compared the reading achievement of fourth and sixth grade American and West German children matched on intelligence, parental occupations, and instructional levels. Both groups were tested using cross-translations of the Gates Reading Survey and the Frankfurter Test. In the American group the mean scores of girls were superior to those of boys on all tests in both grades. However, the reverse was true for the West German children. With the exception of the speed score in grade four (language fluency) the scores of the German boys exceeded those of girls. Preston offered the post-hoc explanation that the predominance of male teachers in these elementary schools accounted for the superiority of male pupils.

Wisenthal (1968) has demonstrated that among French-Canadian children, a male teacher, together with a male environment and attitudes, and with classes segregated by sex, resulted in no differences between boys and girls in reading performance. Lambert (1968) observed similar findings among sex-segregated classes in French-Canadian Schools in Montreal. Other studies on the percentage of female teachers in elementary schools have resulted in similar equivocal findings (Clapp, 1967; Shindling and Peterson, 1970).

Johnson (1973) extended the findings of Preston (1962) by testing boys and girls from distinct cultural milieus and controlling for language differences. Samples of children from the second, fourth, and sixth grades of four English-speaking countries; countries; Canada, England, Nigeria, and the United States were administered the Gates-McGinitie Tests and four experimental Tests from the Wisconsin Design Word Attack Battery. Statistically significant results were found for 18 of the 72 comparisons. In Canada and the United States results favored girls while in Nigeria and England boys

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scored higher than girls. Johnson (1973) also suggests that the role of teachers may be a factor which accounted for these findings. Proportionately, more female teachers were found in the schools of Canada and the United States relative to England and Nigeria. Teacher expectations may be an important factor. Some 80 per cent of the Canadian and American teachers judged girls to be superior readers. An alternative explanation, however, may be found in the question of the egalitarian nature of the societies, i.e., are boys and girls equally encouraged to pursue educational opportunities in the countries investigated? Such entry factors may operate to create further confusion in understanding the interactive effects of culture and the percentages of reading disabled pupils. To summarize, it does not appear that there is convincing support for the thesis that the percentage of male or female teachers can account for sex differences in reading.

Maturational Lag Hypothesis

Several authors have postulated that some children (mostly boys) with reading disabilities seem to experience a "maturational lag" (Heilman, 1961; Bender, 1963; Critchley, 1964; de Hirsch, 1965; Rutter, et al., 1970). In addition to poor visual-motor copying performance, de Hirsch quotes in evidence such symptoms as weak cerebral dominance, immature EEG records, and other signs of delayed maturation. According to Bender the etiology is not one of a structural defect but rather a congenital pattern. Katrina de Hirsch and her associates (1966), for example, working with premature children, found these children lagging in several areas including reading ability. Still another form of this hypothesis suggests that differences in developmental growth pattern between boys and girls could account for differences in reading

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performance. Tanner (1961) observed that around the age of six, boys lag some 12 months behind girls in skeletal age. Nelson (1959) reports data on the onset of skeletal ossification for males and females. For the seven bones mentioned, girls were at least a year ahead of the boys and sometimes more. Similarly, Betts (1936) and Bryant (1962) have discussed boys' lesser capacity to mature smoothly.

This argument is found lacking for several reasons. While physical maturation is undoubtedly related to academic performance, no relationship has been reported between growth correlates such as skeletal age and bone ossification and reading success. The burden of proof would fall on studies demonstrating that early maturing boys encounter less difficulty learning to read. No studies were located which support this view. Pauley (1951), for example, reported that even when boys were significantly older than first grade girls, boys scored significantly lower than girls on reading tests. Secondly, the issue is further confounded when one considers that advanced mental development would likely be concomitant with early maturation per se. Tanner (in Carmichael, 1970, pp. 109-110), for example, reports that among European and North American school systems, children who are physically more mature score, on the average, slightly higher on most tests of mental ability when compared with same-age peers who are physically less mature. Such differences, although slight, are consistent and appear as early as 6½ years of age. Finally, skeletal maturity tells us very little about the brain structures which underlie the development of language skills. Until measures of the physical maturation of brain tissue in children are available to researchers this question is difficult to investigate. Dywer (1974) has

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also summarized several additional factors which argue against a purely maturational explanation of sex differences. These have included variability in rate and level of maturation, sustained superiority of girls over boys in reading when maturation superiority is decreasing, similarity in rate of development for the sexes despite maturational superiority of the girls, and failure of older boys to excel girls in reading and failure of girls to excel boys in other subject matter areas despite their maturational superiority. Thus, "maturational lag" as a tenable hypothesis to account for sex differences in reading is found to be inadequate.

Brain Lateralization

Differences in cerebral dominance offer yet another explanation of how biological factors may operate in the sexes. In general the left hemisphere seems to mediate the perception and production of language while the right hemisphere seems to mediate the production of nonverbal sounds and spatial abilities. In his study, Kimura (1967), reported a delayed left-hemisphere dominance for boys relative to girls. This finding only occurred for less advantaged children and not for children from professional homes. Studies of the role of maturation of cerebral hemispheres and localization of function, i.e., verbal and spatial abilities, have resulted in equivocal findings (Buffery and Gray, (1972); Knox and Kimura, 1970; Kimura, 1969; Buffery, 1971.) Buffery and Gray (1972) have proposed that the earlier well-lateralized brains of females facilitate the verbal development of females while the more bilateral representation of males facilitates their development of spatial skills. Interestingly, Bannatyne (1971) has proposed a clinical subgroup of dyslexic

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boys who are visually-spatially competent although they perform poorly in reading and related language tasks. He has argued that these boys have difficulty in suppressing right hemisphere functions when confronted with reading tasks such as scanning print in one dimension as required in rapid reading. In contrast, Sperry, (1968) and his co-workers have argued a somewhat contradictory view based on their studies of patients in whom the functional connections between the two halves of the brain have been severed. They have argued that the general view of localization of verbal functions in the left hemisphere and spatial functions in the right hemisphere tends to be weaker in women. A related study by Landell (1969) also supports this view. In his study adult epileptic patients had an epileptic focus in either the right or left temporal lobe surgically removed. Later, language and non-language tests were administered to all patients. Loss of the left temporal lobe resulted in more serious impairment of verbal functioning in women than in men. Conversely, loss of the right temporal lobe (which seems to be more important for visuo-spatial competency) resulted in more serious impairment of spatial reasoning for men than for women.

Kagan (1972) has posed yet another possible explanation based on the fact that the paired cerebral hemispheres of the brain become increasingly asymmetric as one hemisphere gains dominance over the other. That is, as Gazzaniga (1970) suggests, the cerebral hemispheres of the neonate are of approximately equal dominance, but with maturity, the left hemisphere (the major site of language functions for most individuals) gains dominance over the right. Thus, a developmentally precocious girl would attain left-hemisphere dominance at a faster rate than a similar aged boy. This speculation

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fits well with the extensive documentation of the earlier acquisition of language functions in girls.

The role of brain lateralization in understanding sex differences in reading is a provocative research area. Maccoby and Jacklin (1973) caution researchers, however, to consider the extent to which theories of brain lateralization can account for other areas of cognitive abilities in the sexes and how the interaction between the onset of hemispheric dominance and the establishment of preferred modes of solving problems may develop in the sexes. Still another area of concern is the necessity of explaining changes in intellectual processes in both sexes well after cerebral lateralization is complete.

Biophysical Vulnerability of Boys

It is well known that more boys than girls are subject to anomalies of prenatal development, birth injury, and childhood disease (Pasamanick, 1960; Lapouse and Monk, 1964; Singer et al., 1968; Garai and Scheinfeld, 1968). Incidence rates for the two sexes are substantially different. For example, stuttering is three to four times as frequent among boys and reading disabilities are from three to ten times more frequent among boys. Thus, at the lower end of the ability continuum for tests of cognitive abilities including reading measures boys can be expected to have a higher representation in the population. Furthermore, since children with low test scores tended to be placed in classes for the educationally handicapped, more boys than girls will be found in these classrooms. Maccoby and Jacklin (1974) argue, however, that such findings may not obtain for all populations of infants.

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They suggest improvement in the care of mothers and infants at the time of delivery should reduce these sex differences or conceivably eliminate them. In fact, however, reading disabilities among boys appear to be as prevalent in affluent communities as they are in the poorer communities. The importance of the biophysical vulnerability of boys in understanding reading retardation in boys cannot be discounted, however.

Inherited Factors in Language Development: A Biological Explanation

Educators who have worked with disabled readers have been reluctant to consider seriously the operation of inherited factors in reading performance. More specifically, the possibility that inherited factors may account partially for the disproportionate number of males among the populations of disabled readers has received little serious consideration. In part, this may be due to what is erroneously perceived as the necessarily nihilistic implications of biological differences. Nevertheless, the evidence of the heritability of general and specific language functions and the presence of familial inheritance patterns in some dyslexic children strongly suggests that these studies cannot be discounted. Indeed, it would appear that these studies should be re-examined to delineate the moderating effects of sex, if any, on the heritability of language functions. With respect to disabled readers, for example, medical and developmental histories have often revealed a familial history of reading difficulties (Hallgren, 1950; Herman, 1959; Arnold, 1961; Brewer, 1963; Walker and Cole, 1965; Owens et al., 1968; Silver, 1971). A position favoring either an extreme environmentalist or genetic bias would be in error. However, in reviewing investigations of genetic factors in language functions, this author was unable to locate any studies which

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indicated that genetic factors play a minimal or minor role in language functioning.

Bannatyne (1971, pp. 180-185) has stated that there exists a genetically acquired trait which could be described as the ability to acquire and process language fluently and that this ability is represented more intensely in females rather than males. This line of reasoning is consonant with Brewer's (1963) review:

"...After a survey of all published cases, we may well agree that Brewer's conclusion that congenital language disability is probably a dominant, sex-influenced trait with at least fair penetrance...Of particular interest are the extremes of the normal range. Both global language-facilitation and global language difficulties may be attributed to inherited factors. Transitions from borderline abnormal appear as delayed onset of speech, protracted articulatory difficulties in childhood, congenital expressive disorders, or conversely, hyperfluency resulting in cluttering or pathological talkativeness. (Lenneberg, 1967)."

Thus, although it is primarily a male characteristic, it is not caused by a single, sex-linked gene as in baldness. Rather, it is "a multifaceted complex set of sensorimotor and cognitive characteristics, it must be a wide-spread pattern accross many genes (polygenic) or characters all of which contribute their part (Bannatyne, 1971, p. 388)." Height offers a physical analogy. Height is normally distributed in the population and

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males are typically taller than females, the differences in means being significant. The genes which program the development of glands, bones, muscle tissue, and the like determine height. The lower end of the continuous distribution will be represented by some short males who are perfectly normal in all respects excepting their height. They are not dwarfs with abnormal genetic inheritance, nor are they short due to malnutrition, poor eating habits, "damage" during pregnancy or birth, or endocrinological dysfunction, or disease. They are the progeny of short fathers and the generations before them.

The possibility that such a sex linked factor may exist is not mere speculation. Maccoby and Jacklin (1974) reviewed considerable evidence supporting the view that boys excel in visual spatial ability and that it is in part determined by a sex-linked recessive genetic mechanism. Verbal abilities, like spatial abilities show a significant degree of heritability. However, research evidence has not yet identified sex linkage in the inherited component of verbal abilities. It may be that such a factor might be found for some specific verbal abilities, i.e., ability to acquire and process language fluently, and not others.

Insert figure 1 about here

Figure 1 presents this hypothesis in graphic form. The trait, "Ability to Acquire and Process Language Fluently." is depicted along the abscissa. The trait is assumed to be normally distributed among the general population with a mean for females which exceeds the population mean for males. The two curves represent the hypothesis that males, in the aggregate, possess less

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of this trait. Thus, at the lower end of the continuum this factor alone could account for the disproportionately greater numbers of disabled male readers. If an arbitrary point on this scale defines reading disability, then it can be seen that the ratio of males to females (the per cent of cases under the curve), substantially favors males. To restate the thesis it is strongly suggested that the disproportionate numbers of boys among many disabled readers in the general population may be due primarily to inherited factors of language development and not due to female teachers, school environment, feminine curriculum, and other psycho-social factors.

Implications for Practice and Research

If this hypothesis is tenable, what are the implications for practitioners and researchers?

First, it may re-direct research and preventive efforts towards a serious and intensive consideration of genetic determinants of later language disabilities. Explanations of language disabilities have not always been carefully considered on the basis of empirical evidence. Goldman and May (1970), for example, expressed a viewpoint suggesting that television, the novel, and other mass media may have contributed to the greater prevalence of speech handicaps, social adjustments, emotional disturbance, learning disability and mental retardation among males (!). At the research level the hypothesis put forth in this review argues strongly for differential diagnosis among disabled readers. Disabled readers who have a genetic history of reading disabilities may require remedial techniques peculiar to them as a clinical subgroup. Accurate diagnosis and remediation will enable disabled readers to achieve a sufficiently high perfor-

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mance to function adequately in our society.

Secondly, at the preventive level, it may suggest that younger siblings of disabled readers who may potentially have reading difficulties could receive professional services at an early point in their development if learning disabilities are diagnosed. Thus, intervention could take place before the child begins formal education and a program of remediation could be initiated prior to school matriculation. An amelioration of the cognitive deficits could be established well in advance of the time the child begins formal education and the deliberate process of learning to read. Bannatyne (1975) has developed a battery of early screening and diagnostic tests for just such a purpose. The battery contains two screening phases and was designed and normed for children between the ages of 3-9 and 6-3 years. The battery is based on an extensive review of the research literature and reflects the most essential indicators of educational handicaps and learning disabilities. Research studies are needed, however, to determine if intervention programs for these children could significantly reduce academic failure in the primary grades. Furthermore, prospective parents with a history of reading difficulties could receive genetic counseling and supportive discussions aimed at developing insight into their own personal reading problems and the possibility of this occurring in their progeny.

Finally, consideration of sex differences within investigations of genetic factors of language functions may provide valuable clues in the understanding of the etiology of dyslexia and related language disorders.

TABLE 1

Space Devoted to Sex Differences
In Reading In College Reading Texts

<u>Authors</u>	<u>Title</u>	<u>Date</u>	<u>Space</u>
Ekwall, E.	Teacher's Handbook on Diagnosis and Remediation in Reading	1977	none
Thomas, E.L. Robinson, H.A.	Improving Reading in Every Class - Abridged, 2nd Ed.	1977	none
Wilson, R.M.	Diagnostic and Remedial Reading for Classroom and Clinic	1977	none
Zintz, M.V.	Corrective Reading, 3rd. Ed.	1977	none
Burns, P.C. Roe, B.D.	Teaching Reading in Today's Elementary Schools	1976	7 lines
Ekwall, E.	Diagnosis and Remediation of the Disabled Reader	1976	none
Harris, L.A. Smith, C.B.	Reading Instruction, 2nd ed.	1976	none
Lamb, P. Arnold, R., (eds.)	Reading: Foundations and Instructional Strategies	1976	½ page
Otto, W. Chester, R.D.	Objective-Based Reading	1976	none
Petty, W.T.	Curriculum for the Modern Elementary School	1976	none
Harris, A.J.	How to Increase Reading Ability	1975	3/4 page
Karlin, R.	Teaching Elementary Reading: Principles and Strategies, 2nd Ed.	1975	15 lines
Silvaroli, N.J. Wheelock, W.H.	Teaching Reading: A Decision-Making Process	1975	14 lines
Beery, A., et al	Elementary Reading Instruction: Selected Materials II	1974	1½ pages
Otto, W. et al	Focused Reading Instruction	1974	none
Crisuolo, N.P.	Improving Classroom Reading Instruction	1973	1 page

TABLE 1 (cont.)

Space Devoted to Sex Differences
In Reading In College Reading Texts

<u>Authors</u>	<u>Title</u>	<u>Date</u>	<u>Space</u>
Veatch, J. et al	Key Words to Reading: The Language Experience Approach Begins	1973	none
Durkin, D.	Phonics, Linguistics and Reading	1972	none
Hafner, L.E. Hayden, B.J.	Patterns of Teaching Reading in the Elementary School	1972	none
Heilman, A.W.	Principles and Practices of Teaching Reading, 3rd Ed.	1972	7½ pages
Bush, C.L. Huebner, M.H.	Strategies for Reading in the Elementary School	1970	12 lines
DeBoer, J.J. Dallman, M.	The Teaching of Reading, 3rd Ed.	1970	none
Cushenbery, D.C.	Reading Improvement in the Elementary School	1969	none
Kaluger, G. Kalson, C.J.	Reading and Learning Disabilities	1969	7 lines
Spache, G.D. Spache, E.B.	Reading in the Elementary Schools 2nd Ed.	1969	3/4 lines
Strong, R.	Diagnostic Teaching of Reading	1969	2 lines
Tinker, M.A. McCullough, C.M.	Teaching Elementary Reading 3rd Ed.	1968	none
Heilman, A.W.	Principles and Practices of Teaching Reading, 2nd Ed.	1967	(Ch. 13) 21 pages
Bond, G.L. Wagner, E.B.	Teaching the Child to Read	1966	none
Strickland, R.G.	The Language Arts in the Elementary School, 2nd Ed.	1966	½ page
Dechant, E.V.	Improving the Teaching of Reading	1964	2 3/4 pages
Mazurkiewicz, A.J. (Ed.)	New Perspectives in Reading Instruction	1964	none

TABLE I (cont.)

Space Devoted to Sex Differences
In Reading In College Reading Texts

<u>Authors</u>	<u>Title</u>	<u>Date</u>	<u>Space</u>
Dawson, M.A. Bamman, H.A.	Fundamentals of Basic Reading Instruction	1963	3 pages
Gans, R.	Common Sense in Teaching Reading	1963	none
Gray, L.	Teaching Children to Read 3rd Ed.	1963	none
Smith, N.B.	Reading Instruction for Today's Children	1963	2 pages
Carter, H.L.J. McGinnis, D.J.	Teaching Individuals to Read	1962	none
Barbe, W.B.	Educator's Guide to Personal- ized Reading Instruction	1961	21 lines
Brogan, P. Fox, L.K.	Helping Children Read	1961	none
Russell, D.H.	Children Learn to Read 2nd Ed.	1961	16 lines
Hunnicut, C.W. Iverson, W.J. (Eds.)	Research in the Three R's	1958	9 pages
Broom, M.E. et al	Effective Reading Instruction, 2nd Ed.	1951	none
Harris, A.J.	How to Increase Reading Ability 2nd Ed.	1949	none
Dolch, E.W.	Problems in Reading	1948	none

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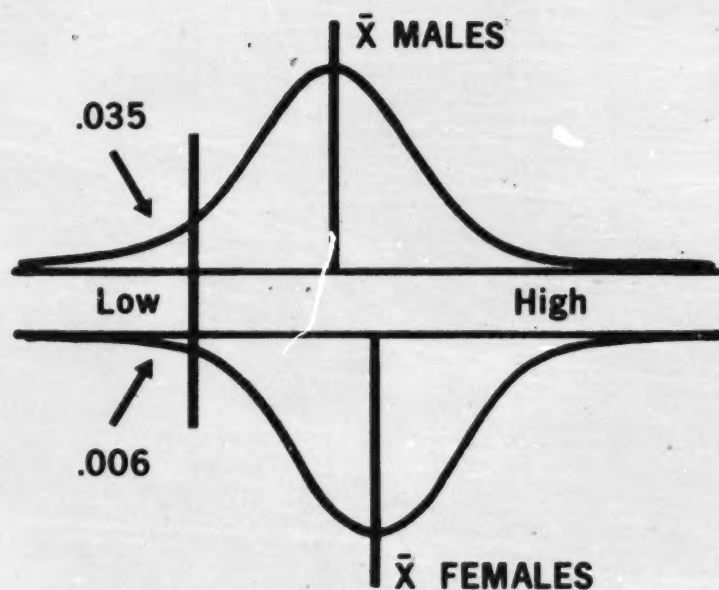


Figure 1. Hypothetical Normal Distribution Curves Representing the Trait, "Ability to Acquire and Process Language Easily", for Males and Females.